Patent Application of

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For

TITLE: SAFELANDER

PRIORITY:

This patent is based on, and claims priority over, Provisional Patent: SAFELANDER, Serial Number: 60514669, Filing Date: 10/27/03, Express Mail Label No.: EU181405482US, by Leslie Jae Lenell and Seymour Levine.

CROSS-REFERENCE TO RELATED APPLICATIONS: None.

FEDERALLY SPONSORED RESEARCH: None.

SEQUENCE LISTING: None.

References Cited

US PATENT DOCUMENTS

NUMBER	DATE	CLASS
5,890,079	3/30/99	701/14
5,974,349	10/26/99	701/29
5,067,674	11/26/91	244/190
4,964,598	10/23/90	244/190

BACKGROUND

This invention relates to a remote pilot, located on the ground in a high fidelity virtual reality simulator, taking control of a civilian or military aircraft such as:

a) Executive (small to medium sized) Aircraft
b) Passenger/Carrier Aircraft
c) Cargo Aircraft

in order to provide relief to the aircraft's pilot(s) or to facilitate a safe landing which minimizes the loss of life and property damage from an aircraft that deviates from its air traffic control approved safe trajectory and/or approved flight plan.

Situations arise where an aircraft is piloted in such a way as to put the public in harms way. This can occur from a rogue pilot(s), terrorist(s), and/or problems aboard the aircraft that renders the flight crew incapable of safely piloting the aircraft (e.g.: sudden decompression). An example of the above was the aircraft hijacking that occurred on September 11, 2001 where two commercial carrier aircraft were steered into the World Trade Center, another commercial carrier aircraft into the Pentagon and a fourth commercial carrier crashed in Pennsylvania, when its passengers attempted to take control away from the hijackers. Under the 9/11 scenario, with SAFELANDER'S remote pilot(s) located on the ground and using ciphered telemetry, the planes would be piloted away from large metropolitan areas and safely landed at airfields that minimizes the loss of life to both the persons aboard the aircraft and those located on the ground. Although SAFELANDER potentially wouldn't save all lives, it would substantially reduce the fatality count. SAFELANDER also acts as an effective deterrent to aircraft hijacking, since it eliminates the hijackers' ability to inflict a large number of ground deaths and/or destroy significant edifices.

A substantial economic benefit of this invention is to reduce the cost of flying by permitting a single pilot aboard Executive Aircraft, Passenger/Carrier Aircraft, Cargo Aircraft and large Military Aircraft. These aircraft traditionally have had two pilots in the flight crew (i.e.: pilot and copilot). With the advent of modern telemetry, communication, high fidelity virtual reality simulation, autopilot and the instrument landing system, an aircraft can be safely piloted with just a single onboard pilot and the use of a remote pilot located in a ground-based high fidelity virtual reality aircraft cockpit simulator.

The remote pilot:

I. provides relief to the onboard pilot and/or handles emergencies should the aircraft's pilot become disabled;

II. is an experienced licensed pilot who is highly trained in the handling of emergency procedures and landings of the specific type(s) of aircraft;

III. is provided with the ability to communicate in real-time with the air traffic control, manufacturer, security, and air carrier personnel in order to provide the safest conning/guiding and landing of an aircraft;

IV. can concurrently and safely control a plurality of aircraft.

U.S. Patents Numbers 5,890,079 and 5,974,349 provide the means for the transmittal of flight recorder information to a Central Ground-Based Processing Station. This information in real-time contains the critical operational aircraft data that is mandatory for replicating the flight conditions at a secure high fidelity virtual reality remote pilot ground-based simulator. Also, U.S. Patents Numbers 5,890,079 and 5,974,349 establish the mandatory real-time two-way radio frequency (RF) telemetry (aircraft to ground and ground to aircraft) communication capability with Air Traffic Control/Management (ATC/M). Yet the above-cited patents don't have the onboard aircraft electronic interfaces necessary to enable the remote piloting of an aircraft. Nor do they provide a high fidelity virtual reality secure aircraft cockpit simulator necessary for safely remote piloting an operational aircraft in congested airspace.

U.S. Patent 5,067,674 mixes video data taken from an aircraft with terrain data taken from a database to project a three-dimensional display of the aircraft to a remotely located pilot. This patent only utilizes a small subset of the needed data to safely control a commercial carrier aircraft in a highly congested air space or during taxiing on the ground. The patent also doesn't provide a means where a single remote pilot can concurrently control a plurality of aircraft.

U.S. Patent 4,964,598 also deals with the apparatus for controlling an aircraft, particularly remotely controlled aircraft. This transmits some critical flight control data of the aircraft to a remote located pilot who controls the aircraft and has the ability to transmit some critical control data to the aircraft for controlling it. The patent doesn't provide the necessary safeguards to control a carrier aircraft on the ground or in a congested air space. Nor does U.S. Patent 4,964,598 provide for a single remote pilot safely and concurrently controlling a plurality of aircraft.

None of the above cited patents provide the necessary safeguards for the remote control of large commercial and/or military aircraft, which presently utilize two pilots (pilot/copilot), operating in heavily congested civilian air space and at airports. What is needed is a remote pilot capability that provides the safeguards to enhance aviation safety to a level that not only

increases the safety of the passengers onboard an aircraft but also enhances the safety of persons on the ground and protects significant edifices from pilot error and/or terrorism.

In conclusion, insofar as the patent applicants are concerned, no other aircraft remote pilot capability formerly developed provides the necessary safeguards and capabilities to allow the dynamic transfer of the piloting function between the onboard pilot(s) and the ground-based remote pilot(s) for the control of Executive (small to medium sized) Aircraft, Passenger/Carrier Aircraft, Cargo Aircraft and large Military Aircraft. SAFELANDER permits aircraft, such as the above, to be operated remotely and safely in highly congested airspace. It also permits these aircraft to be safely piloted by a single onboard pilot should that mode of operation be selected. SAFELANDER substantially reduces the cost of flying and the cost of providing national and aviation security while enhancing aviation safety.

SUMMARY

The invention permits the safe landing of an aircraft equipped with a flight control unit, instrument landing system and autopilot by a remote pilot, located on the ground in a high fidelity virtual reality simulator. The invention has significant cost, security and safety advantages over the present method of controlling large Military, Executive (small to medium sized) Aircraft, Passenger/Carrier Aircraft, and Cargo Aircraft. It saves the cost of putting armed sky-marshals aboard commercial aircraft, eliminates the need for, and concomitantly safety and security problems associated with, allowing guns aboard commercial aircraft. SAFELANDER increases safety and security by providing a safer, more humane, more effective, less costly and quicker response time in altering a deviant aircraft's flight trajectory as compared to having an armed fighter aircraft intercept and possibly shoot down the deviant aircraft.

Accordingly several objectives and advantages of the invention are to provide a means of increasing aircraft in-air safety, on-ground safety, and security. Also SAFELANDER significantly lowers the overall cost of air travel by minimizing the cost of flight security as well as aircraft cost, fuel and piloting. Still further objectives and advantages of this invention will become apparent from a study of the following description and accompanying drawings.

DRAWINGS

FIG. 1 shows the communication system. It shows how a remote pilot, operating in a secure aircraft simulator that provides a virtual reality cockpit, communicates and interfaces with an aircraft to be remotely controlled. It also shows some of the data provided both to the aircraft and to the aircraft simulator operated by the remote pilot.

FIG. 2 shows an aircraft that is fitted with a remote pilot electronic interface that permits the data seen by the aircraft's pilot to be transmitted to the ground for utilization by the remote pilot. It also shows the control system interface aboard said aircraft that permits the remote pilot simulator to transmit control signals to be received and utilized by said aircraft for the purpose of conning/steering the aircraft.

FIG. 3 shows the ground processing and ciphered, anti-jam and anti-spoof data telemetry transmission system that permits SAFELANDER to securely receive data from a plurality of sources and to transmit aircraft conning control data from an aircraft simulator for remote piloting of an Executive (small to medium sized) Aircraft, Passenger/Carrier Aircraft, Cargo Aircraft and large Military Aircraft.

FIG. 4 shows the integration of the SAFELANDER simulator into the ground-based data distribution system of Executive (small to medium sized) Aircraft, Passenger/Carrier Aircraft, Cargo Aircraft and large Military Aircraft.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows the SAFELANDER COMMUNICATION SYSTEM. An antenna 8 transmits and receives digital data from a remote pilot in a secure aircraft simulator 7 to a global ciphered communication data link 1. The global satellite communication data link 1 transfers data from/to the remote pilot located in a secure aircraft simulator 7 to/from the aircraft 2 (which is shown as a single aircraft but is representative of a plurality of other aircraft which may be concurrently operational). The control data for piloting the aircraft are displayed in the remote pilot simulator 7 and when the remote pilot located in simulator 7 takes control of the aircraft 2 the command conning data is transmitted to the aircraft 2. In many instances, when available, there isn't a need for global data and FIG. 1 also shows a direct ciphered digital data two-way communication link 3 between the aircraft 2 and the simulator 7. Simulator processor 6 provides the extensive digital

computer capability necessary to control a high fidelity, virtual reality, cockpit environment, with or without a synthetic vision display. Also simulator 7 receives the air traffic control/management data (ATC/M), and if available weather, map and terrain data and security data 4 over the secure ground ciphered two way digital data link 5. A subset of the digital data transmitted/received over Link 5 can also be transmitted /received by aircraft 2 via global ciphered communication digital data link 1. The remote pilot in simulator 7 can communicate directly with aircraft 2 via ground link 5's interface to the global communication link 1.

FIG. 2 shows the SAFELANDER AVIONICS SYSTEM. Aircraft 2 is fitted to receive GPS/GLONASS Satellite 9 signals. The aircraft 2 has onboard a Global Positioning System/ Global Navigation Satellite System (GPS/GLONASS) Receiver 10 to accept 3-dimensional (Latitude, Longitude and Altitude) position data as well as 3-dimensional (North/South, East/West and Vertical) velocity data. Aircraft 2 also has a plurality of monitored performance and control flight signals going to the aircraft's flight control unit, instrument landing system, flight data recorders, autopilot, etc. These performance and control sensor data 11 signals are sent to a sensor muliplexer transceiver 12 for ciphered telemetry to the ground-based aircraft simulator 7. Since there exists a plurality of aircraft 2, each targeted aircraft has a unique identification (ID). The sensor muliplexer transceiver 12 of each specific/unique aircraft uses its unique ID to recognize and utilize only the information being specifically transmitted to the targeted aircraft as its designated data from the antenna 8 (in Fig. 3) of the CGBS. In a similar manner when a specific aircraft transmits its data to the antenna 8 (in Fig. 3) of the CGBS, the sensor muliplexer transceiver 12 adds its unique aircraft identification (ID) to the data stream in order to enable the CGBS to parse the data stream and to recognize that it is from each specific/unique aircraft. The signals are used in the simulator 7 to duplicate aircraft 2's environment. Also shown is the Remote Pilot Electronic Interface 13 that is used to accept signals from the remote pilot in the ground-based simulator 7 to allow for the remote piloting of aircraft 2. It accomplishes this by interfacing with the Flight Control Unit (FCU), Instrument Landing System (ILS) and Autopilot 13 of aircraft 2. For planes equipped with video data 14 this data is also transmitted to the ground-based simulator 7 for situation awareness. Aircraft acoustic data 15 is also transmitted from the aircraft 2 to the simulator 7. An advisory system 16 is shown situated in the cockpit of the aircraft 2 to provide both display and keyboard entry

communication between the simulator 7 and the aircraft 2. Also shown in FIG.2 is the Global Communication Link 1 for providing ciphered telemetry between the aircraft 2 and the simulator 7.

FIG. 3 shows the CENTRAL GROUND-BASED PROCESSING STATION (CGBS) used for collecting and disseminating the digital data from a plurality of aircraft and aviation sources. The CGBS digitally processes such sources and then ciphers the digital data so that it can be exclusively/uniquely/solely utilized by the targeted aircraft 2. It also shows the antenna 8 utilized for transmitting and receiving radio frequency (RF) ciphered two-way digital data between the CGBS and the targeted aircraft 2. Since there exists a plurality of aircraft 2, each targeted aircraft has a unique identification (ID) that permits the CGBS to process each individual aircraft 2 as a unique vehicle. The CGBS, by adding the unique aircraft ID to its transmitted data stream, can send data to a specific/unique aircraft, or send a general message to a group of aircraft, or a global message to all aircraft. To assure the integrity, security and uniqueness of critical digital data going to and from all aircraft 2 the antenna control and RF interface 23 perform the cipher/decipher, anti-jam and anti-spoof controller functions. All of the communication both to and from the aircraft 2 and other aircraft are stored in the data storage 18 section of the CGBS for archival retrieval should that become necessary for post flight analysis. The CGBS also acts as the communication control unit for the air traffic control/management (ATC/M) module 19 data and the Air Carrier and Aircraft Manufacturers Communication Module 20. In order for the CGBS to process the large amount of digital data, communication and ciphering information a processor 21 acts as an intelligent controller. The CGBS provides visibility to the many transactions taking place at this site via a display and control system 22. The Remote Pilot Simulator 7 communicates with aircraft 2 though the ATC/M Module 19. The Remote Pilot Simulator 7 communication to/from ATC/M Module 19, with aircraft 2 includes the aircraft control parameters (e.g.: aircraft ID, 3-D position, 3-D velocity, heading, velocity, target state and target change reports – waypoints, etc.) via the secure ground digital data 5. The ATC/M. weather, map, terrain and security communication 4 from the ATC/M Module 19 is transmitted/received over the secure ground digital data link 5. The ATC/M 19 and aircraft data from a plurality of CGBS' is also distributed over the secure ground digital data link 5.

FIG. 4 shows the GROUND-BASED DATA DISTRIBUTION SYSTEM. The processor 21 integrates the Air Traffic Control/Management (ATC/M) module 19 with the Air Carrier and

Aircraft Manufacturing Communication Module 20. The ATC/M module 28 assimilates Terminal Radar Approach Control (TRACON) ATC/M 25 digital data with digital Map Database 26, Weather Database 27, digital Topographic Database 28 and En-route ATC/M 29 data. The Air Carrier and Aircraft Manufacturers Communication Module 20 integrates all Air Carrier and Aircraft Emergency & Maintenance, Warnings/Cautions, Simulations 30 and the Remote Pilot Secure Aircraft Simulator 7. For training purposes, among others, the Remote Pilot Simulator 7 can also be interfaced to an aircraft manufacturer's simulator located at either the Air Carrier or Aircraft Manufacturing Facility 30. This permits the remote pilot located in the ground-based Remote Pilot Simulator 7 to undergo emergency training using data derived from an aircraft manufacturer or air carrier simulator, in place of operational aircraft data, prior to any actual aircraft problems. It permits the remote pilot a chance to practice varying emergency landing procedures and maneuvers concurrent with an in-flight aircraft, such as Aircraft 2, being on autopilot. This maybe a vital capability since many aircraft that are experiencing major problems with a landing can be operated on autopilot for a substantial portion of flight time prior to attempting to land said aircraft. This technique optimizes the success in landing an aircraft that is experiencing landing related problems.

REFERENCED NUMERALS

1 Global Satellite Two Way Ciphered Digital Data Communication Link
2 Aircraft That Can Be Remotely Controlled
3 Two way Aircraft-Ground Direct Ciphered Digital Data Communication Link
4 ATC/M, Weather, Map, Terrain & Security Data
5 Two Way Secure Ground Ciphered Digital Data Link
6 Simulator Processor
7 Remote Pilot Secure Aircraft Simulator (High Fidelity Virtual Reality Cockpit)
8 Radio Frequency (RF) Antenna
9 GPS/GLONASS Navigation Satellite
10 GPS/GLONASS Navigation Receiver
11 Aircraft Performance and Control Sensor Data
12 Sensor Multiplexer Transceiver
13 Remote Pilot Electronic Interface (FCU, ILS, Autopilot Interfaces)
14 Video Data

15 Acoustic Data

16 Advisory System

18. Data Storage

19. ATC/M Module

20. Air Carriers and Aircraft Manufacturers Communication Module

21. CGBS Processor

22. Display and Control System

23. Antenna Control and RF Interface (Cipher, Anti-jam & Anti-spoof Communication)

25. TRACON ATC/M

26. Map Database

27. Weather Database

28. Topographic Database

29. En-route ATC/M

30. Air Carrier & Aircraft Manufacturer Facility

- **Emergency & Maintenance, Warnings/Cautions, Simulations**

OPERATION

In the preferred patent embodiment of SAFELANDER, the remote pilot can perform the piloting function of an operational aircraft from a ground-based simulator 7. In order to assure that simulator 7 is operated by an authorized remote pilot, electronic identification, such as fingerprint, and/or eye, and/or face recognition, etc. are employed along with a keyboard entered access code. Simulator 7 is located in a high security site to further prevent its being utilized by unauthorized personnel or sabotaged. To assure data integrity SAFELANDER uses a cipher code that is periodically altered. This code is used for ciphering all of the telemetry data going to and from both the aircraft 2 (representative of a plurality of operational aircraft) in FIG. 1 and the CGBS FIG. 3 (representative of a plurality of CGBS). The remote pilot located in simulator 7 is a trained and licensed pilot for the designated aircraft 2 that the remote pilot is to assume the piloting function of and is also highly trained in the handling of emergency situations. The remote pilot located in simulator 7 is in a ground facility that permits direct communication with experts over the high-speed secure ground ciphered digital data links 5 to minimize injuries, fatalities and destruction.

Should aviation security or ATC/M personnel deem that an aircraft, such as aircraft 2, is deviating substantially from a safe and approved flight plan trajectory, they, via a secure ground digital data link 5, can request that the remote pilot in simulator 7 assume control of aircraft 2 and land it at a specified airfield. The airfield selected could be the initial airfield specified in the operational flight plan of aircraft 2, or may be at an airfield that is specified by security to keep the trajectory of aircraft 2 away from highly populated or strategically important edifices, and/or at an airfield where security and emergency personnel are available to intercept aircraft 2. The remote pilot located in simulator 7 may even alter the time of landing to assure that security and emergency personnel are available.

When aircraft 2 is at an airport terminal, or on a runway, the remote pilot located in simulator 7 could prevent aircraft 2 from moving or could taxi it to an isolated location in the airport that is selected to be the safest location for handling problem aircraft.

In a similar fashion most planes such as aircraft 2 are equipped with a pilot initiated emergency button that gets transmitted to the ground. On reception of this signal and with the aid of security personnel and air carrier personnel a decision could be made to have the remote pilot take control of the rogue aircraft 2. The remote pilot located in simulator 7, with the aid of security and air carrier personnel, may decide to relinquish control of aircraft 2 back to the onboard pilot of aircraft 2 should that be deemed the proper thing to do. As such, SAFELANDER offers a more humane, safer and lower cost alternative for controlling a rogue aircraft 2 than the present existing methodology (e.g.: having a large number of armed fighter aircraft, in the air and available, to shoot down an aircraft, such as aircraft 2, or having large number of armed flight crew members or security personnel available to fire ammunition onboard an in-flight aircraft, such as aircraft 2).

Another economic advantage of the invention is the reduction of the flight crew of large aircraft from a pilot and co-pilot flight crew to a single onboard pilot. Using SAFELANDER a pilot who needs a break from the piloting function could notify the remote pilot located in simulator 7. The remote pilot located in simulator 7 could then take over the piloting function until the onboard pilot is once again available. At that point the onboard pilot of aircraft 2 would transmit to the remote pilot located in simulator 7 the request to resume the piloting function of aircraft 2. The remote pilot located in simulator 7 would then enable and return the piloting capability back to the onboard pilot in aircraft

2. Most large aircraft, as opposed to fighter or small civil aircraft, presently utilize two pilots (pilot and copilot) for the aircraft piloting function. SAFELANDER can permit large aircraft to operate with only a single onboard pilot and yet provide the enhanced safety of a remote pilot located in simulator 7 who has access to advanced safety tools. Utilizing a single onboard pilot saves the wages/cost of a copilot and permits the aircraft to be fitted with just a single piloting station in the cockpit. Aircraft equipped with a single piloting station reduce aircraft weight and costly avionics. These features of the patent reduce the cost of flying while still enhancing safety and security.

SAFELANDER offers significant safety and its concomitant economic benefits over the existing large aircraft system. Many times aircraft experience dire landing problems. The pilot/pilots onboard aircraft 2 may have never experienced a problem such as what is occurring. The decision as to what represents the safest approach to handle a problem aboard an in-flight aircraft may be complex. In this case the aircraft problem could be reported to the remote pilot located in simulator 7. The remote pilot located in simulator 7 may then communicate and coordinate with the Air Carrier and Aircraft Manufacturer 30 to plan for the safest method of handling the situation. This may even amount to having the remote pilot's simulator 7 displays and indicators being driven by a simulation program originated at the air carrier and/or aircraft manufacture facility 30. Then several flight scenarios could be tried and practiced by the remote pilot located in simulator 7 to determine the safest way of handling the situation. During this process the remote pilot located in simulator 7 would be dynamically trained in the safest way to pilot aircraft 2 to a landing. Based on a caucus with the onboard pilot in aircraft 2, the air carrier, aircraft manufacturer, security personnel and ATC, it may be determined that the remote pilot located in simulator 7 should take control of the aircraft 2 for the safety of the passengers and ground personnel. It may also be determined that the remote pilot in 7 should aid the onboard aircraft pilot 2 via communication as to the safest way to handle the situation. As such, SAFELANDER will reduce the number of fatal crashes that have plagued commercial aircraft and have been traditionally assigned to "pilot error".

SAFELANDER brings the technology of safely guiding commercial and large military aircraft by remotely located pilot, operating in a high fidelity virtual reality cockpit in simulator 7, into the world of aviation. In order to accomplish this, it is necessary for the remote pilot located in simulator 7 to be interfaced with the present ATC/M module air

carrier and aircraft manufacturers communication module this is shown in Figure 4. In the virtual reality cockpit the remote pilot located in simulator 7, will experience the same environment as the pilot in aircraft 2 with the exception of feeling temperature, pressure, and the effects of gravity. SAFELANDER's simulator 7 can be made to simulate temperature, pressure and gravity effects of aircraft 2, but this invention does not include this function since the major objective is to promote the safety of aircraft 2. The remote pilot in simulator 7 can operate much more efficiently to assure the safety of aircraft 2 by not being subjected to extreme pressure, temperature and gravity disturbances. This also is one of the advantages of SAFELANDER.

Since a virtual reality cockpit that mirrors aircraft 2's cockpit communication and operation is required in order to prevent crashes, etc., it is critical to air traffic control that SAFELANDER's simulator 7 communications go through the ATC/M 19 module as shown in FIG. 3. Also, since archival retrieval of post flight data is necessary for problem identification and correction is necessary, this data memory capability is shown in the data storage 18 unit of FIG. 3. SAFELANDER provides a much more complete record of events than the present onboard flight recorder system since all data is safely stored in real-time at the CGBS FIG 3. This can eliminate the need for retrieving onboard flight recorder data in many cases. The centralized recording capability is another economic benefit of the SAFELANDER invention.

The basic operation is that a remote pilot sitting in the SAFELANDER simulator 7 can have a virtual cockpit display of an aircraft 2 similar to what the onboard pilot of aircraft 2 experiences. This is possible since the performance and control sensor data 11 of aircraft 2 is combined in the sensor multiplexer transceiver 12 and then transmitted to the ground via the ground-air digital data link 1 to the remote pilot's simulator processor 6. The control and sensor data 11 of aircraft 2 then drives the displays and controls of the SAFELANDER virtual reality simulator 7 to duplicate the displays and controls in aircraft 2. Should the need arise for the remote pilot to take control of the piloting function of aircraft 2, this can be accomplished by sending, via telemetry, ciphered control signals through the digital data link 8 up to aircraft 2. These signals permit interface with aircraft 2 via the remote pilot electronic interface 13. Aircraft 2 is fitted with interface 13 such that upon receiving commands from the SAFELANDER's remote pilot located in simulator 7 the aircraft 2 follows the piloting directed by the remote pilot located in simulator 7 instead of the onboard

pilot in aircraft 2. The remote pilot sitting in SAFELANDER simulator 7 has a high fidelity virtual reality replication of the flight control system and is now in control of aircraft 2 just as if remote pilot located in simulator 7 was sitting in and conning aircraft 2.

The remote pilot located in simulator 7 has access to the ATC/M, weather, map, terrain and security data 4 required to safely pilot the aircraft 2 and interfaces directly with the ATC/M personnel just as if he was the onboard pilot. The ATC/M personnel handle communication with the remote pilot located in simulator 7 the same way as if the remote pilot was the onboard pilot in aircraft 2. The one exception being ATC/M knows that aircraft 2 is being remotely piloted.

Should the remote pilot located in simulator 7 desire to, based on the advice of security, ATC/M, air carrier and air manufacturer personnel, relinquish control of aircraft 2 back to the onboard pilot, he can accomplish this via ciphered data transmission 1 to aircraft 2. Once the remote pilot located in simulator 7 relinquishes the control back to the onboard pilot, the onboard pilot assumes the piloting function of aircraft 2. The piloting function of aircraft 2 (which represents one of a plurality of aircraft) could be transferred back and forth between the onboard pilot in aircraft 2 and the remote pilot located in simulator 7 should that be so desired. SAFELANDER simulator 7 represents one of a plurality of simulators. The number of SAFELANDER simulators 7 is only a very small fraction of the number of operational aircraft similar to aircraft 2. The communication link 1 cited in the preferred embodiment of the patent provides for a global capability but can also be limited to local or country coverage (ciphered digital data communication link 3).

SAFELANDER allows a remote pilot to control the piloting function of several in-air aircraft by selecting a safe trajectory for each aircraft; then putting them on autopilot. Once that is accomplished, the remote pilot can select, directly control, fly and land each individual aircraft sequentially.